# Concept for Novel Atomic Clock with Reduced Size, Weight, and Power Operating on Principle of Measurement of Alignment-Associated Non-Decay Heating Events (AANDHE)

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## Introduction

To begin to develop a more practical, smaller and likely more accurate atomic clock, one needs to understand the fundamental forces responsible for the predictable decay of caesium atoms in traditional atomic clocks.

## Abstract

I have, for many years, been of the belief that electron alignments, which are fundamentally probabilistic, generate at a predictable interval Coulomb forces that tug at protons in the caesium nucleus. A perfect alignment of electrons in all shells results in a proton being "plucked" from the nucleus and both protons and neutrons being emitted detectably from the Cs-133.

Detecting these neutrons requires heavy and power-intensive mechanisms, but the accuracy of atomic clocks, made possible by their consistent function even at a wide range of temperatures, makes them the only type of clock suitable for certain applications.

Recently, advances in inertial navigation technology have made it possible to maintain an accurate positional fix for at least a week at a time, even in a GPS-denied environment. This, however, depends upon having accurate clocks in the inertial navigation system due to the need to measure the timing and duration of altered light conduction within a magnetic crystal structure as explained in the relevant publication on that topic.

While the detection of emitted neutrons is perhaps the most mechanically cumbersome aspect of building a working atomic clock, this is not the only way to take advantage of the natural clockwork-like nature of electron clouds in a variety of elements, including stable isotopes that never decay.

If these decay events in caesium are driven by electron alignments, this means that a tugging force is routinely exerted against all nuclei in all elements with at least a certain number of electron shells. Heavy elements, beginning with caesium, have six shells, which seems to be the magic number when it comes to these Coulomb alignments.

It stands to reason that even in other six-shelled isotopes that do not decay, that the fundamental alignments that underpin decay still occur in these isotopes at a predictable interval. In those cases, rather than a decay event, we could expect to see a tugging on the nucleus in one particular direction i.e. a sudden increase in the temperature of a single atom.

Temperature is often viewed as a corruptive influence on accurate clocks and

a variable for which we must compensate. Temperature is a dimension of entropy and is the primary driver of entropy in the Universe, with dimensions of electrical flow and velocity being secondary influences. Atomic clocks, it is important to understand, are made possible by the consistent speed of light in the Universe. This is, ultimately, dictated by the rate of the expansion of the Universe which determines the overall velocity at which everything in the Universe is moving. The higher the absolute velocity of all things, the higher light's speed. The more rapidly electrical energy is dissipated in the reverse temporal dimension. The consistent rate at which electrons will orbit an atom under most thermal conditions is a microcosm, therefore, of a Universal constant of velocity and indirectly informs us of the expansion rate of the Universe in addition to providing an accurate clock mechanism.

LASER interferometry makes it possible to measure the temperature of a single atom with extraordinary precision. We define temperature as the tendency of an atoms as a whole to move about with respect to one another. Temperature increases in a single atom relative to the atom's surroundings are characterized by the nucleus of the atom undulating to a greater degree and in a different direction than the atom's electron cloud. These oscillations generally move haphazardly in all directions save for certain exceptional circumstances. The degree of these undulations relative to the electron cloud determine the rate of change of the temperature of a substance.

I propose that we may use LASER interferometry to measure clockwork-like, idiosyncratic changes to nuclear oscillatory motion in stable elements such as lead (82) that are generally overlooked but which can be attributed to these electron alignments. If our measurment mechanism can be contained and operated in an atmospheric vacuum and shielded from light other than the light used to make constant measurement of nuclear oscillation, we may use any inexplicably abrupt increases in both temperature and nuclear oscillatory direction as measured by LASER interferometry from two 90-degree offset vantage points to identify when an Alignment-Associated Non-Decay Heating Event (AANDHE) has occurred. Each AANDHE in a given element may be considered one 'unit' of time. These events, since they are relative changes to temperature and not absolute changes, are agnostic to most external thermal effects.

## Conclusion

These sorts of alignment events should occur with greater frequency and regularity the more electrons are circulating around the element. Just as using many atomic clocks in conjunction provides a more accurate overall measurement, each atom's multitude of electrons serves as an ipso facto natural averaging mechanism. By looking for these precursors of decay in stable isotopes rather than decay itself, we may make not only more accurate, but more compact atomic clocks. As with traditional atomic clocks, in my proposed system, multiple clock mechanisms may yet have their outputs averaged to further enhance the accuracy of the overall clock mechanism.